STAN-EVAL NOTES
CIVIL AIR PATROL VIRGINIA WING
UNITED STATES AIR FORCE AUXILIARY
7401 Airfield Drive
Richmond, Virginia 23237-2250
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New CAPR 60-1 Released Effective April 2012: All pilots should take the time out to review the changes to CAPR 60-1 effective April 2012 (Click here for a copy). Changes include:

- Permits VFR-only non-ARCHER qualified pilots to fly the GA-8.
- Requires Teacher Orientation Program pilots to hold commercial pilot privileges.
- Expands the orientation pilot exam and endorsement requirements.
- Requires appointment in Ops Quals for various pilot qualifications.
- Clarifies pilot checkride trend analysis reporting in WMIRS.
- Requires upload of pilot and medical certificates into Ops Quals.

In addition to the new CAPR 60-1, there are new forms for the Form 5 and Form 91 check ride. Be sure to use these in all future check rides.

Instructor Pilot Clinic: We are well into the planning for the unfunded instructor pilot clinic at VAWG HQ at KFCI on Saturday 23 June. This clinic is open to any active VAWG Instructor pilot; check pilot, or pilot examiner. If you are not currently any of these but want to be, you may attend the course space permitting. Attendees from outside VAWG are also welcome space permitting. Please send an email with your name and CAPID to steve.hertz@ngc.com if you are interested in attending. The clinic will start promptly at 1000 and end at 1600 rain or shine.

Copies of Air Plains POH Supplement Available on line (G. Jackson): Air Plains now has current Airplane Flight Manual Supplements available for our 172 aircraft that have an Air Plains 180HP engine conversion and gross weight increase STC. These Flight Manual Supplements may be downloaded and printed from their web site. A copy of the Flight Manual Supplement is required in each aircraft with an Air Plains conversion STC (the POH should already have a signed copy – don't replace these).

C182T G1000 Tail Strikes: VAWG had its fourth incident in the last two years involving a tail strike on our C182T G1000 Aircraft. In three of these incidents the pilots acknowledged that they either flared the aircraft too high or used excessive aerodynamic braking (e.g. holding the tail low after landing) which resulted in the tail strike. In the other incident we were unable to determine when the damage occurred so we are not sure of the circumstances or the pilot involved. These incidents represent a systemic lack of airmanship. Thus it is time to go back to the basics of practicing stabilized approaches as well as recognizing when an unstable approach should be terminated by doing a Go-Around procedure. These incidents are counter intuitive as C182 aircraft tend to be nose heavy and experience nose first landings. Worse still, in each case, the aircrew seemed to be unaware that a tail strike had occurred. Tail strikes are usually very noticeable because of the associated noise and vibration. Because of these incidents, Col Carter has ordered that every C182T G1000 qualified pilot in VAWG undergo supplemental training to retain currency in the aircraft by a deadline to be announced. Pilots who do not complete this training will lose their C182T G1000 privileges. A syllabus consisting of a minimum of one hour ground training and one hour of flight training has been developed with emphasis on avoiding tail strikes. The training may be given by any qualified CAP instructor pilot but no one in VAWG is exempt. Pilots, Instructors, and Check Pilots will all undergo this training. Photos of the latest strike are shown below.

There are two useful videos every pilot in VAWG should review. The first is a CAP Minnesota Wing video created as a result of a series of tail strikes in that Wing. This video shows how to demonstrate the proper attitude for takeoffs and landings with the plane at rest. If you wish to do this yourself, be sure to follow all of the cautions in the video! (Click here for CAP You Tube Video)

A second video is from UND and provides a good summary of how tail strikes occur and how to avoid them (UND You Tube Video)

New Glider Transponder Code (FAA): In a notice issued on March 7, 2012, the FAA will now offer transponder code 1202 for glider pilots to use when not in contact with ATC. The new code will help ATC differentiate gliders, which have unique flight and maneuvering limitations, from other VFR traffic.

An accident, many incidents, and a National Transportation Safety Board recommendation highlight the need for a national beacon code for gliders that are operating VFR and not in contact with ATC. ATC personnel will be informed of the code, what it represents, and under what limitations the users are typically operating (e.g., unable to hold a requested altitude). Several codes considered in the past have conflicted with other operations

Careful Pre-flights save lives: Two VAWG pilots found bird nest debris in the tail of N98714 recently. This is just what could be reached by hand through the access hole at the vertical stabilizer. It took a vacuum hose to get into the places not reachable by hand. We all look into the cowling intakes at the cylinders and down in the cowling for nests. But, how far do you look when you see straw or bird droppings elsewhere during the preflight? Debris in the cowling can be a fire hazard and block proper cooling. Debris in the tail may cause controllability problems if it interferes with control cables. Be careful out there and be alert to any clues as to potential problems on pre flight.

Runway Slope: Many airports in VAWG have fairly level runways but there are a few that don't. Outside of VAWG there are lots of airports with runways with significant slopes. A sloping runway should not be a surprise as in preparation for the flight we reviewed "all available information" with respect to the flight. That would include the runways of intended use.

So for example, if we planned a flight to W24 (Falwell) just outside of Lynchburg, VA we would note that the AF/D shows it has a runway length of 2932 X 50' which is plenty long enough for our Cessna and GA8 aircraft. But we note that the AF/D also shows right after the runway length the notation "4.7% up W". What does that mean? Falwell has a single runway oriented east and west (9 and 27) with a 4.7% slope up to the west (e.g. the west end is 4.7% higher than the east end). 4.7% up slope may not mean much to you but the following note in the AF/D might get your attention: "Land RWY 28 (west) takeoff RWY 9 (east)". Wow. That means landing and takeoff runways are not up to the pilot but are given (here is where any group of self respecting hanger fliers will immediately argue about whether the AF/D is regulatory and can a pilot really land on RWY 10 and not immediately be hauled off to jail). That's a pretty good hint that this is one steep runway so 4.7% must be a pretty healthy slope. Using advanced quantum mechanics, a 4.7% slope means that the west end of

the runway is about 140 feet higher than the east end. The slope is steep enough that in most wind conditions, it's still better to land on RWY 28 and that's what the local traffic will be expecting. This is another case where good preflight planning pays off. Imagine coming into W24 with the wind favoring RWY 10. Landing RWY 10 could be really ugly. And if you are a CAP pilot flying a CAP airplane your flying career in CAP probably just ended despite what the FAA may or may not say.

Another airport of interest in Virginia is New London W90. The AF/D lists a 3164 X 40' runway with a 2.3% slope to the north. The single runway is oriented 18 and 36. So is that steep enough that slope is an issue? If you have flown into W90 you already know the answer. Although the AF/D and local operations allow takeoff and landings in either direction, most of the time you'll want to land uphill to the north. A 2.3% slope means that the north end is about 75' higher than the south end, a pretty good hill to climb. Finally there is MKJ (Wytheville, VA) which is a favorite spot for CD operations. The AF/D shows only a measly 1.1% slope but if you've landed there, you know it's preferable to land to the west unless there is a strong wind that dictates otherwise. With a 5252' runway length, the west end is about 60' higher than the east end.

We can see that runway slope is one of many variables that pilots must consider for takeoff and landings. Some POH's will provide a means to compute takeoff and landing performance with sloped runways but many don't.

Suppose you want to takeoff at New London (W90) but you have a wind from the north. The sloping runway argues for takeoff to the south while the wind favors takeoff to the north. What's a pilot to do? John T. Lowry's book on small airplane performance addresses this question and the math can get a little deep, but he has a very simple approximate formula (it's also in Sparky Immeson's Mountain Flying Bible) that may help. This simple formula allows you to figure out the "break even" wind. In other words, in the case of our hypothetical New London takeoff, how strong must that northerly wind be before I'll takeoff uphill to the north? The formula is:

*Breakeven Wind = (slope in degrees X takeoff distance in feet with no wind or slope)/ (5 *lift off speed KTAS)*

Just to see how this works, let's take the numbers for New London. It has a 2.3% upslope which is about 1.3 degrees. Assuming a 1000' takeoff distance based on density altitude and a lift off speed of 60 KTAS, it gives a breakeven wind of about 4.3 knots. So you might want to take off uphill if there is a 5 knot or more headwind. How about Falwell? A 4.7% slope is about 2.7 degrees. Let's assume a 1000' takeoff roll and 55 KTAS at liftoff. This gives about 10 knots for a breakeven speed. So taking off uphill isn't advised until the winds are at least 10 knots. Given what the AF/D says however, maybe you just want to stay on the ground?

This simplified formula is an approximation to an approximation so take it with a grain of salt. According to this formula, takeoff downhill if the headwind is less than or equal to the computed breakeven value. The formula also works for landings. Just replace takeoff distance with landing distance and liftoff speed with landing speed (remember to use true, not indicated airspeeds). If your POH accounts for runway slope, use that vice anything said here.

One drawback to this simple formula is that it uses degrees. Unfortunately, the AF/D gives runway slope in percentages so you have to convert a percentage into degrees. The formula here is simple if you have a calculator: degrees = arcsine (slope in percentage /100). A simpler approach is to get yourself that Sporty's slide rule (not the E6B). It's cheap and can account for runway slope, wind, runway type (turf, asphalt), density altitude, etc in one easy operation. It also makes it easy to do "what if" drills. But remember the POH trumps all unless the POH is silent about a particular factor.

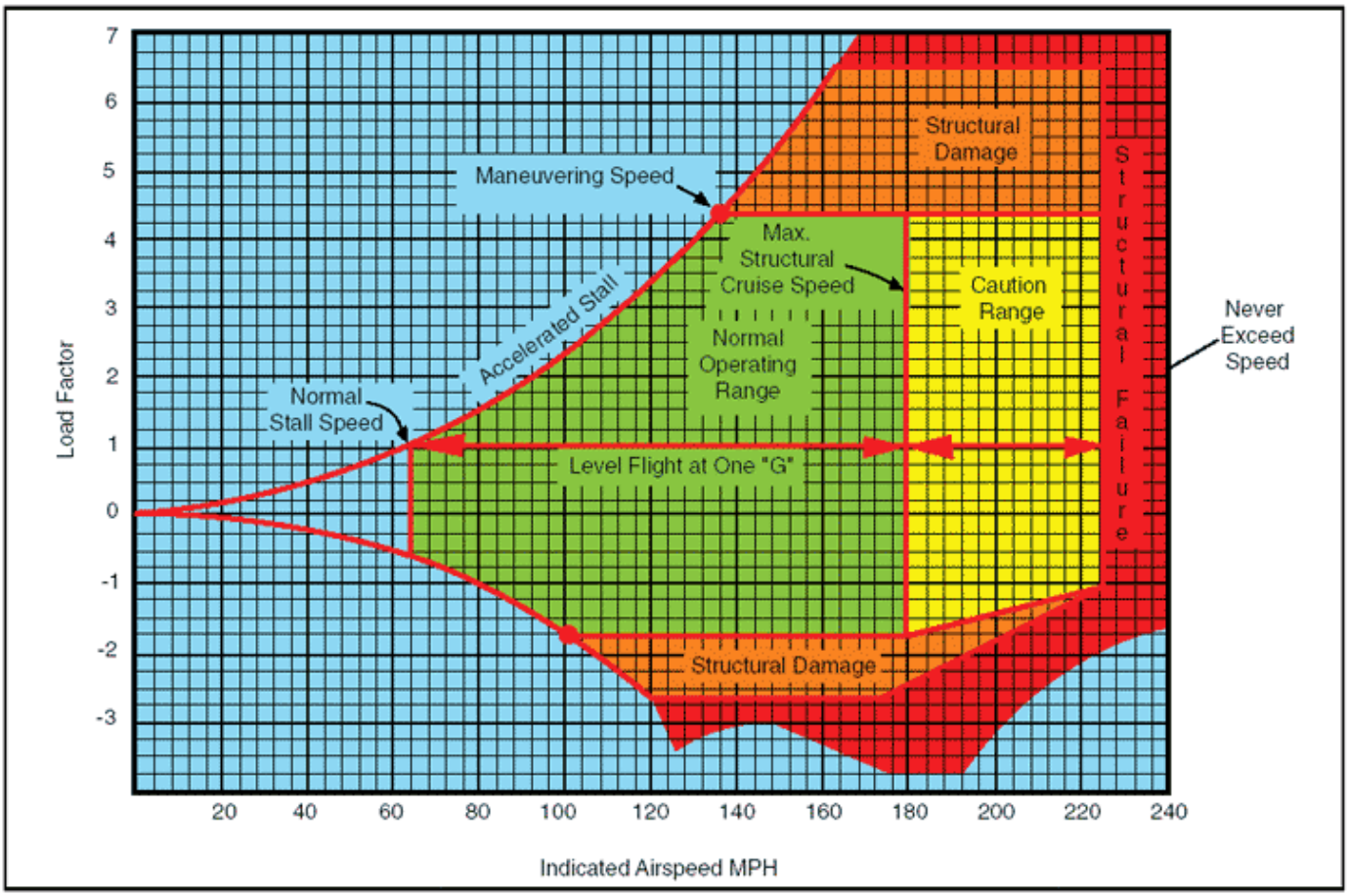
Runway slope as published in the AF/D and elsewhere can be misleading so be careful. The published runway slope is computed by taking the difference between the elevations of the two ends of the runway. So this is an average slope. If for example, we have a 5000' runway that's relatively flat for the first 2000' and then slopes up, the published runway slope will be misleading especially if your aircraft can land and takeoff within the

2000’ of flat runway. And a runway that has the same elevation at both ends but bowed in the middle can be a challenge that the AF/D might not give you a heads up on. Each runway has its own characteristics that aren’t always easy to describe. Talking to a local pilot or calling the FBO can provide a much better description than the AF/D has. Nevertheless, the AF/D and similar sources are invaluable to a pilot especially when landing at an unfamiliar airport.

In summary:

- Check the AF/D or other source of information on any airport of intended landing to avoid surprises. If there is something there you don’t understand, call the FBO and get the local pilot’s perspective. Flight Services are also a great source of information on airports as they will have all the NOTAMs associated with an airport.
- If the runway slope is greater than 0.5%, pay attention to slope!
- Most of the time, choosing the runway of intended landing or takeoff is pretty easy, but sometimes you need to consider all factors before making a decision. Slope is just one of those factors.
- If you land or takeoff at a towered airport, most of the time the tower’s choice of runway is acceptable. But the tower may select a runway based on traffic and ATC considerations ignoring your particular circumstances so don’t hesitate to ask for different runway if you have good reason to do so. You are the PIC. You have the ultimate responsibility for a safe flight.

VG Diagrams: VG diagrams provide a useful picture of the allowable flying regimes of any particular aircraft. The V denotes speed and the G denotes load factor. Flying in the envelope means staying within the bounds of allowable speed and load combinations. Although drawing a VG diagram before every flight might be a little over the top, every pilot needs to respect load factor and V speeds. A VG diagram helps us visualize both. A VG diagram is a function of gross weight. But for a given aircraft the general shape of the envelope doesn't change



The figure shows a typical VG diagram. The vertical axis is load factor and the horizontal axis is speed. We will discuss only the top part of the diagram for now (positive g's). The diagram starts at zero speed and zero g's which corresponds to an aircraft sitting on the ramp. Going to the right along the speed axis to Vs we see that at 1 g we can sustain level flight right at stall speed. If we try and pull more than one g at stall speed we fall outside the envelope (the aircraft stalls). If we continue to the right at 1g we stay within the envelope right up to Vne. At this speed we risk structural failure due solely to excessive speed.

Between stall speed and Va (maneuvering speed) we can pull more and more g's without going outside the envelope but if we do pull excessive g's we only stall the airplane. For example, for this particular aircraft, we can pull about 3 g's at 110 mph before stalling (any stall at more than 1g is an accelerated stall). Beyond Va (which can be seen to be about 135 mph for this aircraft), pulling excessive g's now risks structural damage. So for this aircraft we must limit any loads to less than about 4.2 g's. Or to turn it around a bit, Va is that speed where it is possible to pull g's equal to the load limit factor. Staying below Va means that it is aerodynamically impossible to exceed the load limit factor (the aircraft stalls first).

The area between Vno (maximum structural speed) and Vne (never exceed speed) is interesting. This area is within the envelope and is fine to fly in. But the caution is that at those speeds it's easy to inadvertently induce a high load and get into trouble. That's why this regime is for smooth air only. Technically Vno is defined as that airspeed where the aircraft can withstand a 30 fps vertical gust. Unlike Va, Vno does not vary with aircraft weight. As airspeed increases past Vno, the aircraft's ability to withstand vertical gusts decreases. You don't want to be there in turbulence. Rule of thumb is stay below Vno in light turbulence and below Va in moderate or greater turbulence.

The VG diagram also differentiates between structural damage (bending metal) and structural failure (a quaint engineering term for when the wing falls off). Neither is a pleasant experience although the first is usually survivable. There was a recent incident at one of our local flight schools where a pilot inadvertently flew through wake turbulence in a C172. It bent the wing badly and knocked the pilot semi conscious. But he was able to maintain consciousness and regain control of the aircraft. Both the pilot and the aircraft were restored to flight after extensive repairs to both.

We've discussed positive g's but similar logic applies to negative g's. A quick glance shows that this aircraft will take a lot more positive g's than negative which is true for most aircraft. Aerobatic aircraft however provide much more generous margins. A Decathlon for example has an envelope from a positive 6 g's to a negative 5 g's. An Extra has g limits that exceed the pilot's. Note also that Va for negative g's is less than for positive g's. For this aircraft, Va for negative g's is about 100 mph which is considerably less than the Va for positive g's of 135 mph. This is an important point for upset recovery. If you are upside down and start pushing for the sky (a good idea), push gently as your load limit factor is usually less than two g's (1.5 in normal category aircraft and 1.8 in this aircraft). Furthermore, recovering from an upset often means pushing for the sky while simultaneously rolling the aircraft. This induces a rolling load as well which can quickly put you outside the envelope. Bottom line is that anytime you push the stick forward, do so gently unless you are below the negative Va. Or just buy a Decathlon.

Va is a source of confusion exacerbated by academic discussions like this one using VG diagrams. Va is indeed what we have said: the speed that defines where the airplane will stall just as it reaches the load limit. In moderate or greater turbulence we are rightly taught to slow to Va to avoid over stressing the airframe. But real life is a bit more complex as in turbulence an aircraft experiences twisting forces which complicates things and puts more stress on the airframe so that slowing to Va may not be sufficient. Recall the Airbus which departed New York and flew through a B747 wake. Although the aircraft was below Va, the pilot flying managed to tear the horizontal stabilizer off by aggressively using the rudder which resulted in total loss of control. Va only accounts for a one time deflection in smooth air, not multiple deflections in turbulence. Unfortunately there is no easy rule of thumb other than to either slow well below Va or fly Va and hope the

designers put in some extra margins they didn't tell us about. Barry Schiff recommends flying ten knots below Va to account for these other factors.

And it's easy to remember when negative or positive Va counts. Pulling on the stick in any attitude induces positive loads and positive Va is the relevant airspeed. Pushing the stick induces negative loads in any attitude and negative Va is the relevant speed. Most POHs only publish Va for positive loads. I guess that is because it's too tough to read Va in the POH when inverted?

See and Avoid: There was a tragic mid-air collision on Memorial Day, just south of the Warrenton-Fauquier Airport (HWY), near Sumerduck, Virginia. A Piper Warrior and Beechcraft Bonanza collided. Lt Col Paul Gardella of CAP, was giving a flight review to the owner of the Bonanza when the collision occurred and the plane went down (this was neither a CAP flight nor a CAP airplane). Both aboard the plane were killed. The pilot of the other aircraft (reported to be TR Proven, former VAWG CC for Minuteman Squadron) managed to land and was taken to Mary Washington Hospital. His aircraft was a total loss. This is one of many mid air collisions involving very experienced and competent pilots. “See and avoid” is critically important but is no guarantee of safety, especially in the crowded airspace typical of the Warrenton area. It is important to use all available resources including any collision avoidance systems, flight following, or filing IFR.

Runway Incursions: The aviation community has made significant progress in reducing runway incursions over the past few years but they still happen and we must continue our vigilance. Some things that have helped to reduce runway incursions have been as simple as repainting hold short lines and improving overall visibility of intersections. New lighting has been added in some cases and “hot spots” have been identified to help focus on troublesome intersections. Although the FAA has been primarily focused on tower controlled airports, runway incursions can happen at non towered airports with equally fatal results so it’s important we exercise caution as we taxi. Here are some excerpts from a recent NASA Call Back that may be helpful:

According to the FAA, there are approximately three runway incursions every day in the United States. A runway incursion is defined as: Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and takeoff of aircraft.

The clearance to “taxi to” a given runway at a particular intersection has the same restriction as a clearance given to “taxi to” the approach end or “full length” of a runway; that is, the pilot must hold short of the runway until cleared to “line up and wait” or is “cleared for takeoff.” The absence of “hold short” instructions should never be construed as clearance to proceed onto the departure runway.

The following, from the FAA Pilot’s Handbook of Aeronautical Knowledge, are some practices to help prevent a runway incursion (I’ve added an asterisk to emphasize those items relevant to non towered operations):

- Read back all runway crossing and/or hold instructions.
- Review airport layouts as part of preflight planning, before descending to land and while taxiing, as needed.*
- Know airport signage.*
- Review NOTAMs for information on runway/taxiway closures and construction areas. *

- Request progressive taxi instructions from ATC when unsure of the taxi route.
- Check for traffic before crossing any runway hold line and before entering a taxiway. *
- Turn on aircraft lights and the rotating beacon or strobe lights while taxing.*
- When landing, clear the active runway as soon as possible*, then wait for taxi instructions before further movement.
- Study and use proper phraseology in order to understand and respond to ground control instructions.
- Write down complex taxi instructions at unfamiliar airports.

Form 5 Clinic: We are planning to host a funded Form 5 clinic in DAN on 21 July. We will have several check pilots and instructor pilots to help you get your next Form 5 done. More details will be forthcoming as the date gets closer.

Articles for the VAWG Stan Eval Newsletter: We are always looking for brief articles of interest to VAWG pilots to include in this newsletter. CAP has many very experienced pilots and aircrew who have useful techniques, experiences, and tips to share. Please send your contribution to steve.hertz@ngc.com. If your article is accepted, you will get a pro rata share of the VAWG Stan Eval Newsletter subscription fees.